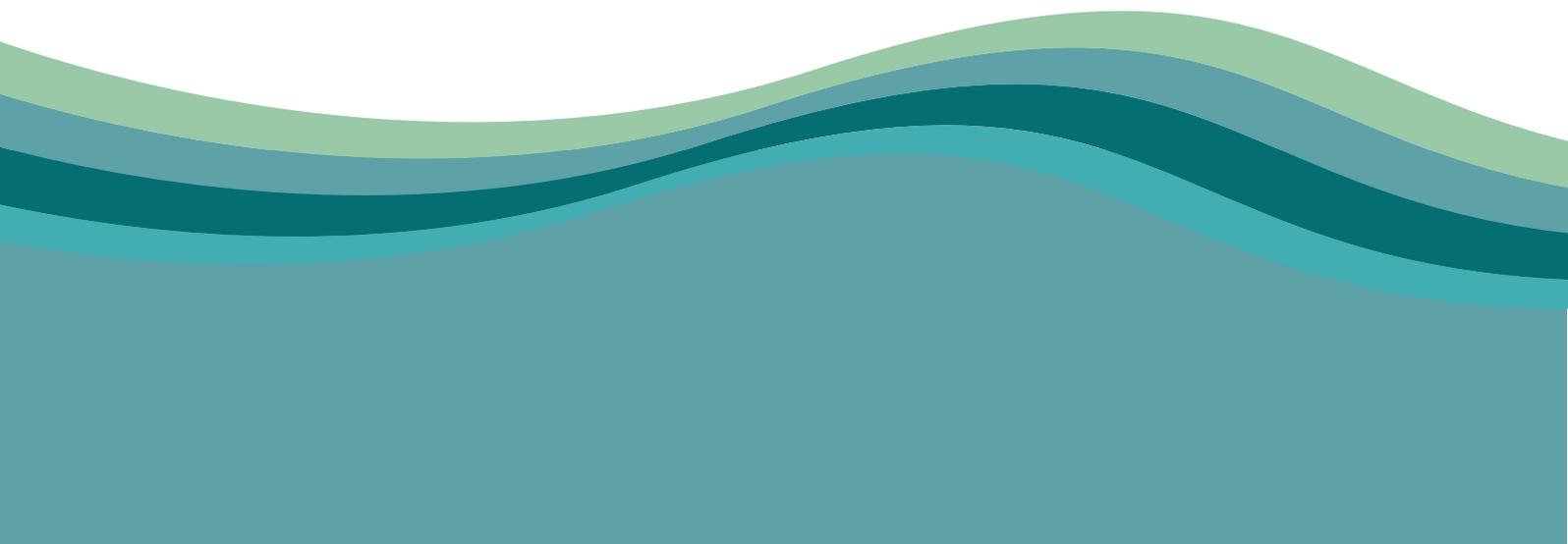


Generating data for FSANZ nutrient datasets

*A guide to designing nutrient analysis programs
for submitting nutrient data to FSANZ*

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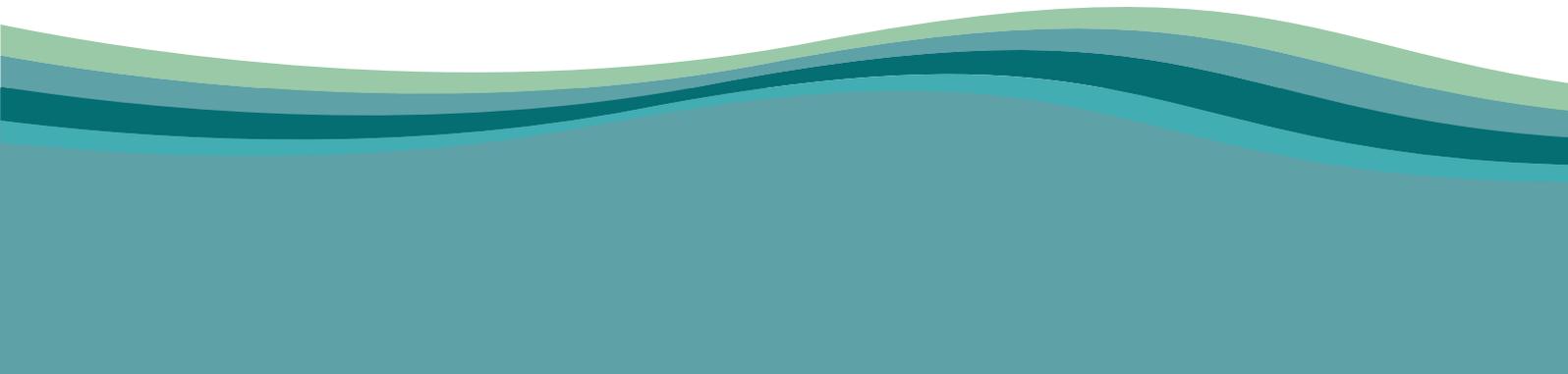
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SECTION 1: FSANZ AND NUTRIENT DATA

Food Standards Australia New Zealand (FSANZ) monitors nutrients in the Australian food supply to inform standards development and compile national nutrient databases. Under the Australian Food Composition Program we generate, compile and publish high quality reference data on the nutrient composition of foods in Australia. We use these data in our standards development work, for dietary modelling in our risk assessments, and to assist with fortification monitoring. Our published datasets are used for a variety of purposes including nutrition labelling, research on diet and disease (including national nutrition surveys), education and to help consumers make better informed food choices.

FSANZ welcomes nutrient data from external bodies such as universities, food and health organisations and the food industry. This part of this guide will explain what data we collect, what data you can provide and how we use the data. The second part, Designing an analytical program, is a guide to designing and carrying out analytical programs that produce high quality food composition data.

FSANZ nutrient database and datasets

FSANZ maintains a database of nutrient composition which we use to publish three food composition datasets: NUTTAB, AUSNUT and the dataset that supports FSANZ's Nutritional Panel Calculator (NPC).

What are NUTTAB, AUSNUT and the NPC?

NUTTAB (NUTrient TABLEs for use in Australia) is the reference dataset for nutrients in the Australian food supply. There are 245 nutrients reported in NUTTAB, but not every food has been analysed for every nutrient. It contains mainly analytical data, i.e. data from laboratory analyses of food.

AUSNUT (AUStralian Food and NUTrient Database) datasets are created for National Nutrition Surveys, such as the 2011-13 Australian Health Survey. AUSNUT datasets have a much wider range of foods as they represent the foods eaten by survey participants. The Department of Health determines which nutrients to include when they commission the survey, and each food in AUSNUT has a value for all of these nutrients. AUSNUT datasets are based on analytical data from NUTTAB. Where we don't have analytical data, we use standard food composition techniques to develop nutrient profiles: for example, we combine our analytical data for pasta, mince and tomato sauces to determine nutrients in spaghetti Bolognese. The AUSNUT food details file will tell you whether data are analysed or from another source.

The Nutrition Panel Calculator (NPC) allows food manufacturers to develop basic nutrition information panels (NIP) for food labels of products based on their recipes and processes. The dataset contains foods from NUTTAB that are likely to be used as ingredients in prepared foods. The NPC contains data for the six nutrients and energy that are required on an NIP.

Why contribute your nutrient data?

Providing data to FSANZ supplements our own analytical work and helps ensure our database accurately represent the current Australian food supply. This provides a sound basis for food standards development and allows us to produce good quality population nutrient intake estimates, such as those reported by the Australian Bureau of Statistics from the National Nutrition and Physical Activity Survey component of the [Australian Health Survey 2011-2013](#). Data included in FSANZ datasets are also easily accessible and used widely by health professionals, the food industry and researchers.

What information does FSANZ include in its database?

FSANZ stores analytical data (i.e. results from laboratory analyses) on nutrients in foods that are available to consumers in Australia. This includes:

- Macronutrients (collectively known as proximates): moisture, fat, protein, ash, sugars, starch, fibre and organic acids
- Minerals
- Vitamins

- Individual fatty acids
- Tryptophan (an amino acid)
- Caffeine
- Cholesterol

We do not require a minimum set of nutrients for submitting data for consideration to be included in our reference database. However, we strongly recommend analysing moisture (or if possible, all proximates) even if you are planning an analysis program for a single nutrient. Moisture and other proximate data allow us to validate your nutrient data and compare it with previous analyses and international data.

If you are interested in providing a 'full' nutrient profile for a food, you can refer to the list of nutrients published in [AUSNUT 2011-13](#) as a guide, noting that:

- we would analyse individual fatty acids and individual sugars to then determine total fatty acid and total sugars levels.
- it is not necessary to analyse a nutrient where the nutrient is known not to be present in the food.

Metadata outlining what foods were sampled, where the samples were from, and how they were prepared and analysed are as important as the analytical values and should always be provided. This information helps to put the analytical values in context, and also helps us to determine the most appropriate use of the data you provide. The metadata provided are stored in our database along with the analytical values, providing an accurate record of how the data were generated. The metadata we collect includes:

- how, when, where and what samples were purchased for analysis such as the food name, the date, state, city/suburb and name of the store the samples were purchased, the brand or variety of the food, the package size and type etc.
- how the samples were prepared for analysis, the weight of the sample before and after preparation, whether individual or composite samples were prepared for analysis
- the nutrient that was analysed and the value (including units), the laboratory that undertook the analysis, the date of analysis and the method of analysis and limits of reporting

Additional data

In addition to nutrient data, we also store a range of information for use in our datasets, such as:

- gross composition of foods such as the proportion of flesh to peel in fruit, skin to meat in poultry or drained weights for tinned products
- average weights for fresh foods, such as individual fruit and vegetable weights or standard cuts of beef, and weights for commercial foods like muffins, bread rolls and pizzas
- density of foods (to convert volume measurements such as a bowl of chips to a gram weight)

These are used to develop nutrient profiles for individual foods and also to put together our food measures dataset which is published with AUSNUT.

How should the data be formatted?

FSANZ does not currently have a defined mechanism for submitting analytical data for inclusion in our nutrient database. However, to reduce the risk of errors we prefer to receive data in a spreadsheet (or similar) format rather than as a word processing or PDF document. We have developed a [spreadsheet template](#) that can be used as a guide to the sample purchase, preparation and analysis information we would collect.

What does FSANZ do with the data?

FSANZ reviews all data provided for quality and appropriateness for inclusion in our nutrient datasets. We will consult with the data providers to address any data issues or questions and to obtain further information if required. Once FSANZ has all the information needed and has determined that the data are suitable, they will be incorporated into our nutrient databank.

From here the data are available for use in FSANZ nutrient datasets AUSNUT, NUTTAB and the NPC. How quickly the data are published in one or more of our datasets depends on the timing of the next dataset

release. Where there is likely to be a long delay between receiving data and publishing a new dataset, we make the data available in short reports on the [‘Data provided by food companies and organisations’](#) page in the NUTTAB section of the FSANZ website.

How we incorporate new data into our datasets depends on what data you have provided and what data already exists. If you are providing data for a wide range of nutrients for a food for which FSANZ has existing analytical data, we may combine both data sets to get an average profile. If your data is for a food for which FSANZ has no existing analytical data, we may create a new food record.

If you are providing data for a limited range of nutrients then this would be considered for inclusion into foods that already exist. If you are providing this data for a food that does not yet exist in any of our datasets, then it is unlikely we will create a new food to publish for only a few values but we will store the data for future use.

SECTION 2: DESIGNING AN ANALYTICAL PROGRAM

The key to a successful analytical program is planning. There are many things that need to be considered before designing and implementing an analytical program to collect data on the nutrient content of foods (called, more generally, food composition data). This document identifies key issues to consider when developing your analytical program. FSANZ is able to help you with information on analytical programs, so please contact us while you are planning your program.

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Program purpose

It is important to be clear on the purpose of your analytical program. For example, is the purpose of your program to collect data on a single nutrient or a range of nutrients? Are you trying to determine the average nutrient content of a food or to determine the variation of nutrient levels likely to be present in a food? Are you trying to get detailed information on a specific nutrient across a wide range of major foods? Knowing this will help guide the development of your sampling plan, sample preparation procedures and the analytical methodology used to generate data for your program.

Selecting foods for analysis (sampling)

The foods selected for analysis will depend on the purpose of the analytical program and is of critical importance in generating good quality food composition data. For example, the selection of foods might cover a new variety or product range for which there is no data, or long standing varieties or products for which there is a need for updated data. For industry organisations and researchers, the foods selected may come from different companies or suppliers and production regions. It will require some prior research on availability, production, storage and distribution of the food so that you have identified the major factors likely to influence nutrient composition.

Some of the key issues that need to be considered when developing a sampling plan include:

- **What foods should be sampled?** It is essential that the samples selected for analysis are representative of the foods as consumed or as available to consumers across Australia. For example, if the purpose of your program is to generate data on a domestic retail product range, then the foods selected for analysis should be from that range rather than a range prepared for catering or export supply. A study on the supply of a particular nutrient across our diets would require sampling and analysing foods that are commonly consumed and/or expected to be a good source of that nutrient. For each food selected, you will also need to consider whether specific brands or varieties will need to be sampled for analysis, or whether it is better for the sample to include a range of brands or varieties for analysis and whether these samples need to be weighted according to production practices or market share.
- **Where and how often should foods be sampled?** For example, should the foods be sampled nationally, across seasons, across the food supply chain or from a range of socio-economic areas? Sampling nationally and across seasons is useful if you need to take into account any potential factors, such as region and climate, may have on the nutrient content of a food. This is particularly relevant for primary produce where nutrient levels in the food may vary due to differences in growing practices. Sampling across the food supply chain could be useful to understand which production practices influence nutrient levels. For example you might wish to include samples collected at the farm, at the processing/packaging plant, at the point of sale and after preparation just before consumption. Broad sampling across regions and seasons is not as important for processed foods that are subject to consistent formulation and high quality control of both the ingredients and the final product. However for processed foods, you should consider whether it is important to select products from retail outlets, rather than just from a production line, so that any effects of storage and transport on nutrient composition are captured.
- **How many samples should be purchased for each food?** As a general rule fewer samples are required to determine the average nutrient content of foods that are distributed nationally from a central location, because these foods are generally subject to consistent formulation and high quality control of both the ingredients and the final product. For these foods, 5–8 samples per food are likely to be

adequate. A larger number of samples are recommended for foods that are expected to be naturally variable. Usually, 8-10 samples of these foods are sufficient, but the more samples you have, the more confidence you can have in the average nutrient content determined.

- **How much of each sample is needed?** The amount of each sample will depend on whether you intend to analyse individual or composite samples (see **Preparing foods for analysis** below), how many nutrients are being analysed for each food and whether, for example, you are going to analyse the food before and after cooking. The analytical laboratory can provide assistance determining the amount of each sample required. Generally for a complete nutrient profile (including proximates, fatty acid profiles and a range of vitamins and minerals) you need around 500 grams of each sample. However you will almost certainly need to collect more than this to account for preparation, cooking and handling losses.
- **Who will do the sampling (i.e. purchasing the food)?** Will you have the capacity to undertake all the sampling for your program or will you require some additional assistance? This will largely depend on the size of your program and company or organisation, and whether you decide to purchase samples nationally and at multiple times throughout the year. Sometimes the analytical laboratory can assist with purchasing samples for analysis.
- **How will you transport the samples to the laboratory?** Foods should arrive at the laboratory in a good condition and without exposure to conditions that could affect nutrient levels. For many foods the logistics of sample transport will influence where foods are collected and where any preparation takes place. This can be a particular issue for programs where samples are being collected in different places with the aim of arriving at the laboratory at the same time.
- **How will the laboratory receive and store samples?** Will they need to be refrigerated or frozen on arrival? Do the foods need to be analysed immediately? To help the laboratory and to make sure the samples can be analysed properly you should discuss this with the laboratory before you start collecting.

Selecting nutrients for analysis

The nutrients selected for analysis will depend on the purpose of the analytical program. For example, you may select different nutrients for analysis depending on whether the purpose of your program is to collect data for a single nutrient, to support food labelling or export market requirements, or to determine the average nutrient content of a range of nutrients for a food. If you are interested in:

- A single nutrient, such as a vitamin or a mineral, it is useful to also determine the moisture content of each food. This will provide an indication of whether differences in analytical values are a result of differences in moisture contents between foods or due to natural variation.
- Generating nutrient data for labelling purposes, it is useful to also determine the proximates as these can be used to validate the data.
- Generating nutrient data for a range of nutrients to determine an average nutrient profile, you can consider not including nutrients that are unlikely to be present in the food. For example, if you are analysing fruits and vegetables, then you will not need to analyse retinol, vitamin B12 and cholesterol as these are only found naturally in animal-based foods.

What are proximates?

Proximates are the macronutrients that make up most of the food, and they are moisture, fat, protein, ash, sugars, starch, fibre and organic acids. Together, they comprise nearly 100% of most foods. Proximate analyses are useful to include in your analytical program to make it easier to compare your results to previous analytical results. They can also be used to confirm that the correct samples were purchased

Preparing foods for analysis (sample preparation)

The sample preparation procedures followed for nutrient analysis will also depend on the purpose of the analytical program. Some of the key issues that will need to be considered when developing a sampling preparation plan include:

- **Should samples be prepared for individual or composite analysis?** Individual analysis involves the collection of multiple primary samples that are analysed separately. Composite analysis involves a mixture of primary samples that are combined prior to analysis. The decision to analyse individual or composite samples will largely depend on whether you are interested in looking at variation in nutrient

levels (i.e. if a food is a good source of a nutrient or is fortified with the nutrient) found in food or whether you require a reasonable average value.

What is composite sampling?

Ideally, if you purchase ten units of a food sample (e.g. 10 apples) then each unit would be analysed separately (an individual sample) and the final result calculated as the mean of these units. With a composite sample, the ten units of apples would be mixed together to produce one sample for analysis. This mixture may include multiples of the same variety/brand of food (i.e. 10 samples of red delicious apples) or it may include a mixture of varieties/brands (i.e. 3x red delicious, 3x pink lady, 2x royal gala and 2x jazz apples). Composite sampling is a cost effective way to find average composition, but does not tell you how nutrient composition may vary with factors like variety, brand or geographic location.

- **Should the samples be prepared for analysis as purchased or as consumed after any necessary preparation?** If it is as consumed, does the preparation method represent the way most people would prepare the food? The decision on preparation methods will also be influenced by how you intend to use the data generated from your program. For example, if the data is going to be used for labelling purposes you should consider the requirements of Standard 1.2.8 of the Food Standards Code. If the data is going to be used for estimating population nutrient intakes then you might focus your analysis on foods as they are usually consumed. If you are interested in changes in nutrient levels through processing you may analyse the food both as purchased and as consumed.

Selecting a laboratory for nutrient analysis

If you don't have your own analytical laboratory available, then you will need to contract a laboratory to undertake the nutrient analysis for your program.

To ensure you generate the best quality data possible from your program, you will need to consider whether the laboratory:

- has experience in managing similar analytical programs
- has the capacity to perform the analytical services within your program timelines
- is accredited for the analysis of nutrients and food matrices selected for your program
- is able to analyse to an appropriate limit of detection for your purposes
- has staff experienced in the analytical method selected for your program
- participates in relevant quality control programs and reports on outcomes.

Budget & resources

In the end, compromises will need to be made on how to sample, prepare and analyse foods to meet your program's purpose while fitting within your staff and laboratory resources, project timelines and budget. A clear program purpose will help make these decisions.

Developing analytical program documentation

Once your initial planning is done, it is useful to develop some protocols that clearly define what samples need to be purchased and how samples should be prepared and analysed. This section identifies the information that should be captured in these protocols.

Developing a food and analyte list

A good place to start is to develop a final list of foods to be analysed, along with the nutrients to be analysed (analytes) for each food. For each nutrient, analytical requirements should be identified, such as whether a specific method of analysis should be used, or a particular limit of reporting/detection/quantification is required.

Developing a sampling plan

Once the list of foods has been selected for analysis, sampling protocols should be developed to provide to the people responsible for purchasing the samples. The document should include information on:

- general purchasing instructions, such as the dates the sampling should take place.
- the exact foods to purchase, including information on specific brands, varieties, fat contents etc. Note: it is just as important to include information on specific products that should not be purchased if there is likely to be some confusion.
- the number of samples required for each food (e.g. you might want the purchasing officer to purchase more than one sample in some locations).
- where the foods should be obtained i.e. nationally, one location, supermarkets, butchers, markets etc.
- how much of each food is required, including the number of items (e.g. 5 apples), or the total weight (e.g. 1L of milk).
- how to select a sample from those on offer. For example, which packet to take off the shelf, whether different batch numbers should be selected where more than one sample is required from the same location.
- what to do if the food specified cannot be found. For example, should they purchase another commonly available brand/variety or should they be allocated another specific brand/variety to purchase?
- what product information should be recorded for each food purchased? For example, should the food name, date of purchase, variety/brand, country of origin, number of items, size, use by/best before date, store name, store location, packaging description etc. be recorded? It is useful to provide purchasing officers with a template to record this information.
- how the foods should be handled after purchase. For example, should the samples be refrigerated, stored in a dark place etc.
- how the foods are to be labelled, packed and transported to the analytical laboratory.

By providing this information, you aim to minimise sampling errors such as:

- incorrect samples purchased
- misidentification of food due to incorrect labelling
- insufficient sample for analysis
- damage to vitamin and mineral content of foods due to incorrect storage conditions
- damage to foods during transport.

Developing sample preparation procedures

Sample processing and preparation protocols should also be developed to provide the laboratory conducting the analysis with guidance on what to do with the samples received for analysis.

These protocol documents should provide information on:

- What to do with incorrectly purchased or damaged samples. For example, should the laboratory request that a new sample be purchased or should the laboratory progress with one less sample, or can the laboratory progress with the incorrectly purchased sample if the analytical plan is adjusted slightly?
- Whether the samples should be photographed, and what information should be captured in the photograph. Photographs are useful to confirm the correct samples have been purchased and to explain any unexpected analytical results.
- The state the foods are to be analysed (i.e. raw vs cooked) and how the samples should be prepared by the laboratory for analysis. For example, does the laboratory need to wash, peel, chop or cook the food? How should the food be cooked and how does the laboratory know when it is cooked correctly?
- Whether the samples should be weighed before and after preparation and whether gross composition data is required. Weighing the food before and after preparation is a useful way to determine the edible and inedible portion of a food and the mass of portions of food. Determining the gross composition of the food such as the proportion of fat to lean meat enables greater flexibility in the way the data can be used later, for example to estimate the nutrient profile for meats with different trimming practices.
- Whether single samples or composite samples are to be analysed.
- How the samples should be handled and stored during preparation and analysis to avoid damage to

vitamin and mineral content (e.g. through exposure to heat and light).

- What preparation information should be recorded for each food purchased? For example, should the food name, laboratory reference, state or territory purchase location, date of preparation, number of items, weight at purchase, weight after preparation, gross composition, sample preparation procedures be recorded? It is often useful to provide the laboratory with a template to record this information.
- What nutrients should be analysed immediately? For example, it is important to analyse vitamin C straight away due to its labile nature.
- Are inter-laboratory validation checks required? Extra sample may need to be collected if so.
- How long the samples should be stored after analysis. It is common for samples to be frozen and stored for up to 12 months after the original analysis, in case additional analysis is required.

By providing the laboratory with these guidelines, you aim to minimise the effect incorrect sample purchase, transport, preparation and storage may have on analytical results generated.

Common issues encountered during sample purchase and preparation

It is important to remember that even the most well planned program has the potential for unexpected problems to arise. These may include:

- purchasing officer forgetting to purchase samples on the agreed date
- samples not available for purchase (i.e. some products may be location specific, sold out or no longer available for sale)
- incorrect samples purchased for analysis
- samples damaged during transport
- samples lost during transport or upon arrival at the analytical laboratory
- method of analysis not suitable for analysing some food/nutrient matrices.

In these situations thought needs to be given to the impact the problem may have on the end results, how the data will be used and the program timelines. For example, if an omega-3 fortified bread was purchased instead of an unfortified white bread, but omega-3 fat content was not going to be analysed, would this impact on the level of other nutrients, or would re-purchasing and transporting a new sample affect the laboratory's ability to complete the nutrient analysis in time.

Reviewing analytical data generated

All the data provided by the analytical laboratory will need to be reviewed. This section outlines some of the general checks that should be considered when assessing the quality of the data generated from your program.

The data checks required will depend on the data generated from your program. Some of the more general data checks may include checking:

- the data for completeness – has the laboratory provided all the information requested and are the results in the correct units?
- the sum of proximates add to between 97-103 g/100 g. This is a general guide that can help to identify some problems and may indicate that further analyses could be considered.
- no single nutrient value is greater than 101 g/100 g
- the sum of individual fatty acids (% basis) is between 97 and 103%
- the sum of individual fatty acids (food basis) is slightly less than the total fat value
- the correct nitrogen factors have been applied to calculate protein content
- the sum of the mineral components is slightly less than the total ash content
- the results are consistent where replicate data (i.e. individual sample data) is available
- the results are logical (for example, is there cholesterol, retinol and vitamin D in plant foods, lactose in non-dairy foods, high water content in dry products etc)
- if there are any outliers (for example, do any of the values look inconsistent with related foods?)
- if there are any unusual trends (for example, are all values for a particular nutrient consistently lower

than expected)

- the nutrient values are consistent with previous analyses. Note: this check should be used as a guide only. Factors that will need to be taken into account when assessing differences include: whether analytical methods were different between analyses, whether the formulation of the food has changed over time etc.
- the nutrient values are consistent with the known composition (i.e. cross-check data with data from other Australian or international studies/databases) and investigating reasons for inconsistencies. Note: this check should be used as a guide only. Things to consider when comparing data across countries include: differences in fortification patterns, formulation, varieties, cooking methods, soil types and naming conventions
- the nutrient values are consistent with nutrition information panels on labels, where available. Note this check should be used as a guide only. The ingredient list can also be useful for identifying the addition of nutrients, oil types, salt and whether the salt is iodised.

If any unusual results are identified in your check, the laboratory should be consulted. If a straight forward explanation for the unusual result cannot be determined the food should be re-analysed for the nutrient in question or an inter-laboratory check could be carried out. Where re-analysis supports the original result, you may consider accepting both sets of results. In this situation, it might also be useful to consult with an expert in the area.

In addition to checking the analytical results, you will need to check that you have received all the relevant sample purchase information, photos, sample preparation information and analytical methodology and QC results generated by the laboratory. All of this information will help to put the analytical results generated from your program into context.

Further information on nutrient data quality can be found in Food Composition Data – production, management and use (Greenfield, H. and Southgate, D.A.T. 2003) available on the FAO website (<http://www.fao.org/docrep/008/y4705e/y4705e00.htm>).

Contact us

If you are planning an analytical program please contact us during the planning phase. We can

- provide advice on running food analytical programs,
- let you know which foods or nutrients we have limited data for, and
- help ensure that your data is suitable for our datasets.

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